

implies a majority which cares nothing for science and much "for the rights of property" and the prospect of increased dividends; nevertheless even the majority is willing to follow the leaders it has chosen, and the leaders will lose nothing if they remember that we have duties to perform towards the past as well as towards the present.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.]

The Green Sun

THE appearance of a bright green sun for several days in succession seems to be a phenomenon sufficiently rare to deserve notice in your columns, so I send you the following notes on the subject:—

On Sunday evening, September 9, the sun for some time before setting appeared perfectly rayless and of a bright silvery-white colour, quite different from anything that I have ever seen before. On the following morning I did not observe it particularly, but in the evening I watched it carefully from about five o'clock till sunset. At first it had the same silvery-white appearance as on the previous day, and this continued till 5.30, when it was lost behind a bank of cloud; on its partial reappearance, however, at 5.43, the part visible between the clouds was of a bright pea-green colour. On Tuesday morning it was rather cloudy, but the appearance, when seen at all, was the same as on the preceding night. In the evening, however, it was a magnificent spectacle, and attracted the notice of every one. The silvery sheen was visible early in the afternoon, and the brightness of the sun rapidly faded, till by about five o'clock one could look at it directly without any difficulty. At this time there was a distinct tinge of green in the light when received on a sheet of white paper, while shadows were very prettily tinted with the complementary pink. As the sun sank towards the horizon the green became more and more strongly marked, and by 5.30 it appeared as a bright green disk, with a sharply-defined outline. In fact the definition was so good that a large spot (about 1' long) was a conspicuous object to the naked eye. On this occasion the sun was lost in a bank of clouds near the horizon, but on another occasion, when I was able to see it actually set, the colour got yellow rather than green close to the horizon. Similar, but less marked, were the appearances both at sunset and sunrise for several days, and before sunrise and after sunset the cloud effects were such as I have never before witnessed here. These cloud effects were chiefly remarkable for the brilliancy of the colouring and for the length of time that they were visible, being seen for nearly an hour after sunset. The moon and stars, when near the horizon, showed the same green colours as the sun.

On the 22nd the green sunrises and sunsets began again and continued for three days. I carefully examined the spectrum on every possible occasion with my zodiacal light spectroscope, as well as with a small direct-vision one. The spectrum showed clearly that aqueous vapour played a large part in the phenomena, for all the atmospheric lines usually ascribed to that substance were very strongly developed. But in addition to this there was a very marked general absorption in the red. Even an hour before sunset, and often longer, the absorption was complete as far as B, and the dark shade gradually crept up till it reached C, and at times even that line was invisible, while the absorption was clearly marked up to W.L. 621. At the blue end nothing could be seen beyond W.L. 428, and even that only with a very wide slit, but a photograph showed the lines clearly nearly as far into the ultra violet as on ordinary occasions. The phenomenon was visible over a large area of country, from Ceylon to Vizagapatam, and as far west as Aden. It was not, however, observed at all at the Bombay Observatory.

I am at present collecting information from various sources, and so do not care to enter into many details at present.

Most people ascribe the phenomena to the recent great eruption in Java, but there are difficulties in the way of accepting this

view, which I have not yet been able to get over, and the similar appearance of a blue sun over Europe and America in 1831 seems to make this explanation unnecessary, besides it is well known that the sun appears green under certain circumstances when seen through steam or even in a mist (Lockyer). On the other hand, observations referred to in *NATURE*, vol. xviii. p. 155, tend to show that very fine dust might produce the observed effects.

Can any of your readers refer me to Dr. Schuster's original papers?

It may not be without interest to add that on both occasions the green appearance was preceded by abnormal electrical conditions of the atmosphere. The potential of the air was strongly negative for a number of days in succession from about 9.30 a.m. to 2.30 p.m., with a clear sky and no rain within 100 miles.

C. MICHELLE SMITH

Madras, October 10

I INCLOSE a letter giving an account of the green sun, which may be of interest to your readers. My correspondent is the wife of General Tremenheere, formerly in the Indian army.

WARREN DE LA RUE

73, Portland Place, W., November 3

Spring Grove, Isleworth, November 2

IT may interest you to hear that my daughter, writing from Bellary, tells me that a gentleman who was at Ootacamund, in the Nilgherries, was on one of the higher peaks when the phenomenon of the sun took place in September, and he first distinctly saw a green, cloud-like mist pass across the sun, and then one of a reddish colour, and the sun took the colour of each of these clouds or mists. People at Ceylon were terribly alarmed at the unusual appearance of the sun.

S. S. T.

MR. GREAVES has the pleasure to forward to the Editor an extract from a letter just received from Mr. Beardmore at Madras, referring to the phenomenon of the green sun now being discussed in *NATURE*.

Sunhill, Clevedon, November 2

Harbour Works, Madras, October 10

WE have had the sun here for some weeks past in the mornings and evenings a most curious greenish blue colour, and generally casting a bluish beam of a most pretty tint. Mr. Pogson thinks it due to volcanic dust and sulphurous gases from the great eruption in Java. Another astronomer, Mr. H. Smith, thinks it due to a great amount of aqueous vapour.

NATHL. BERNARD BEARDMORE

The Division of the Circle

ALLOW me to point out an oversight in *NATURE* (vol. xviii. p. 598), where, in explaining the divisions of a circle the following passage occurs: "In quite recent times it has been suggested that 400 parts should be taken in place of 360, but that is a suggestion which up to the present time has not been acted upon."

We probably owe our degrees either to the earlier supposed year of 360 days, or to the fact that this number has many divisors, although such divisors afford no practical advantage. When trigonometrical functions were subsequently discovered, it was found that the natural unit is not the circle, but the quadrant or right angle. Our system of numeration being decimal, it was then most convenient to divide the quadrant decimal, and the circle is thus considered as composed of 4, 40, 400, &c., parts according to the degree of exactness required. This was proposed by Briggs when preparing his logarithms, which are based on decimals, but unfortunately it was then set aside. Revived a long time after by Lagrange, it was acted upon by Laplace in his "Mécanique Céleste," being thus much more than a mere suggestion. Nowadays decimal divisions of the quadrant are the only ones used by French geodesists.

Facts are the grand supporters of argument. Will you kindly quote the following? After grumbling on the necessity of using the only circle at his disposal because it was divided decimal, a French civil engineer would afterwards employ no other: he found the decimal circle much more convenient. A special experiment had been already made in Italy, where two geodesists, carefully interchanged and inspected, had been instructed to

observe and calculate in both systems the same large lot of angles. It was then found that the use of decimals gave a saving of two-sevenths of time either in observation or in calculation. This result was unknown to Sir George Airy, the ablest astronomer of our time, but he judged rightly that the conversion of all sexagesimal angles into decimal ones would materially lighten his labours, and he actually did so when calculating all the lunar observations previously made at Greenwich. This was the largest quantity of reductions ever made by one astronomer, and they were abridged by the use of decimals. The real supporter of sexagesimal divisions is routine, that sly enemy of progress.

Abbadia, November 2

ANTOINE D'ABBADIE

Christian Conrad Sprengel

It has now become a standing topic that C. C. Sprengel's treatise on the structure and fertilisation of flowers "after well nigh a century of oblivion has come to be recognised as one of the most interesting books, and his theory of the adaptation of flowers to fertilisation by insects is one that will ever be associated with his name" (NATURE, vol. xxviii. p. 513). Some writers go so far as to speak of a rediscovery of Sprengel's treatise by Darwin. But it should be acknowledged that Darwin himself says only ("Cross Fertilisation," p. 5): "His discoveries were for a long time neglected." So it seems to be true that Sprengel's and Koelreuter's works were unknown to English naturalists, though Kirby and Spence, at the end of Letter IX., published 1815, and in all subsequent editions till 1867, have given a very fair report in their masterly manner. Not only the facts, but also the importance of these discoveries, are fairly expounded.

In Germany these discoveries were well known to every naturalist during the whole century. In 1829, when a mere boy, my father began to instruct me in entomology. Many times he took Sprengel's work from the shelves in his study, and explained to me the discovery of fertilisation of plants by insects with the help of the plates in Sprengel's book. I have never forgotten the interest and the scientific enthusiasm of his exposition. I was told that we are indebted to a mere chance for this discovery. A rather dangerous irritation of Sprengel's eyes had the result that he was entirely forbidden indoor study by his physician, and was therefore obliged to spend his days in the field, where he was gradually led to the observation of plants, followed by his remarkable discoveries. Certainly between 1830 to 1840 at every university in Prussia the same facts were taught as well known facts of the highest importance, and of course known by every student. Prof. C. F. Burdach has related them in his large "Physiology," vol. i. p. 322, 1826, and given his conclusions. H. Burmeister, "Handb. d. Entomologie," vol. i. p. 303, 1832, speaks about them at some length also as well known and of the highest importance. Not only scientific publications, but merely popular works have the same statements. Pierer's "Universal Lexicon" (first edit. 1836, fourth, 1851, vol. ix. p. 942) gives a fair report.

H. A. HAGEN

Cambridge, Mass., October 23

"Challenger" Zoological Reports

IT seems to me that the reviewer of my Report on the Pelagic Hemiptera collected during the voyage of the *Challenger* (NATURE, vol. xxix. p. 3) is too hypercritical.

I refer, of course, to the paragraph in which he blames me for alluding to species under their trivial names only; and as the paragraph in question is calculated to convey a wrong impression, I should be obliged if you will kindly allow me to say a word on the subject.

It is true that some writers upon insects (or rather upon Lepidoptera only) have the very bad habit of alluding to species (of different genera) by their specific names only, and the law that forbids the practice is a good one; but it may be applied too stringently, and not altogether in the sense that its framers intended.

In my Report I had to deal with two genera, and a reader of the review who had not seen the Report itself would be justified in concluding from the words of the reviewer that I have used the specific names indiscriminately, without indicating the genus to which the species belonged. In point of fact this is not the case. The two genera are treated of separately, and where I have mentioned the trivial without the generic name, it has only been when the generic name governed the paragraph, and, when,

consequently, no doubt could possibly exist as to the genus. In doing so I may have broken the letter of the law, but not, I think, the spirit; and were the work to be done over again, I think I would be inclined to follow the same course.

F. BUCHANAN WHITE

[The idea of a generic term governing a paragraph did not strike me. I had no wish to be over-critical, and I am glad to find that in all essentials Dr. Buchanan White agrees with the views expressed.—THE WRITER OF THE NOTICE.]

Barytes from Chirbury

A NUMBER of crystals of barytes have lately been acquired by Mr. Henson from Chirbury, Salop, which seem to deserve some description. The crystals vary from one to four inches in length and from one-half to two inches in breadth; they are very bright and clear, and are elongated in the direction of the brachy-diagonal, resembling in appearance the barytes from Dufton; they are mostly doubly terminated, and some contain included crystals of copper pyrites. They were at once detected by Mr. T. Davies as being peculiar in form; and the reflecting goniometer revealed the existence upon them of four very well-defined forms which have not been hitherto found upon barytes, besides two more doubtful planes to which it is difficult to assign definite symbols.

The crystals are almost all a combination of the forms—

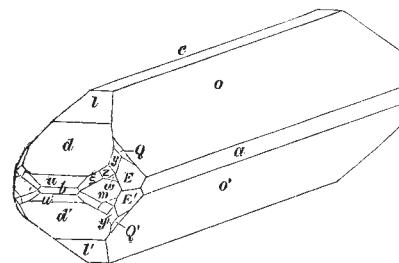
$\sigma \{101\}$	$\tilde{P}\infty$	$E \{412\}$	$2P4$
$d \{012\}$	$\frac{1}{2}P\infty$	$\gamma \{212\}$	$\tilde{P}2$
$m \{110\}$	∞P	$z \{111\}$	P
$l \{014\}$	$\frac{1}{4}P\infty$	$\xi \{232, \frac{3}{2}\tilde{P}\frac{1}{2}\}$	
$u \{011\}$	$\tilde{P}\infty$	$\omega \{432\}$	$2\tilde{P}\frac{1}{4}$
$a \{100\}$	$\infty \tilde{P}\infty$		
$b \{010\}$	$\infty P\infty$		
$c \{001\}$	oP		

On some crystals were also observed—

$\mu \{214\} \frac{1}{2}\tilde{P}2$ between d and σ
 $r \{112\} \frac{1}{2}P$ between d and γ
 $Z \{034\} \frac{3}{4}\tilde{P}\infty$ between u and d .

The general appearance of the crystals is shown in the annexed figure.

Of the above faces ξ , ω , E , and Z are new. ξ lies with parallel



edges between the faces $d m$ and $z b$, and is very dull: ω lies between $y m$ and $z o'$; E between $y a$ and $o z'$.

Several of these crystals have also a small dull face Q lying with parallel edges between o and y , and on one this is accompanied by another small dull face Y between o and m . By oiling these faces it was possible to determine approximately their inclination to o . The measurements lead to the complicated symbols (15.1.15) for Q and (19.1.18) for Y .

The new faces, and especially E , are very characteristic of these specimens, and it is somewhat curious that faces with the simple symbols of ξ , ω , E , Z , have not hitherto been noticed among the sixty-six recorded forms of barytes.

H. A. MIERS

Mineral Department, British Museum, October 25